

Helps Prepare Students for Emergencies

Louisiana is Using Geographic Information Systems in K–12 Classrooms to Provide Authentic Project-Based Learning

Students in Louisiana are solving real-world problems, and they're excited about doing it thanks to an innovative educational program called "Quest with GIS: A Louisiana K–12 Classroom Experience."

The problems students are solving relate to disaster preparedness, an unfortunate reality in many parts of the hurricane-prone state. While their peers nationwide may be learning about emergency planning for the first time because of Homeland Security measures, many Louisiana school children face an ever-present prospect—a storm or flood could force them to evacuate their homes and find suitable shelter with little advance warning.

Through Quest with GIS, Louisiana students are taking an active role in planning how they and their neighbors will safely respond in the event of a natural or man-made disaster, and they are doing so while they learn how to use an online GIS to find their school's location, query a digital map to access information about unfamiliar areas, and input data to help emergency response organizations prepare for hurricanes, floods, oil spills, and other disasters.

Learning about GIS

The Quest program is the cornerstone of a statewide effort spearheaded by the Louisiana Department of Education to bring GIS into K–12 classrooms. On the Quest With GIS project Web site (*Editor's note:* For this and other URLs see Resources on p. 25), teachers and students are able to find an aerial photo of their school's neighborhood, locate their school building, and determine its exact latitude and longitude. Individual schools submit these coordinates

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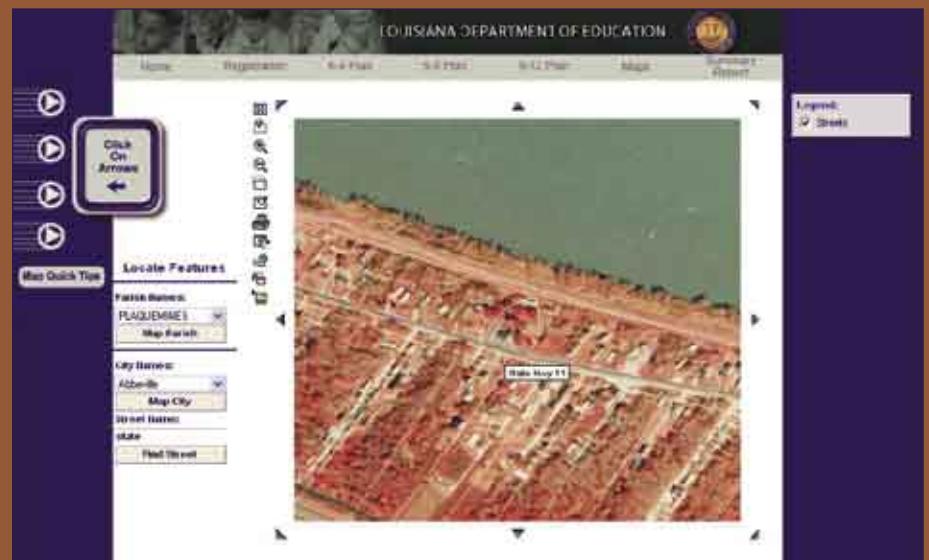
and other information about building facilities to a survey form on the Web site. As the submissions accumulate during the project, students, teachers, and the public are able to see the number of schools increase as they appear on the Web site map. In collecting their data, teachers and students are guided by detailed lesson plans for three age groups: grades K–4, 5–8, and 9–12. The online lesson plans, which were created using the Louisiana Department of Education's lesson plan builder, are aligned with state curriculum standards in social studies (geography and civics), English language arts, mathematics, and health.

For more than a year prior to the kickoff of the student projects in late 2002, the department's Louisiana Center for Educational Technology (LCET) offered hands-on GIS workshops to social studies teachers who, upon completion of the courses, received a commercial GIS software package for use in their classes.

"We want Louisiana students to be familiar with this exciting technology," said assistant superintendent for the Louisiana Department of Education, Sheila Talamo. "This year's Quest with GIS is a relatively simple project requiring no special training. It's an introduction to the importance of GIS."

With technical support from commercial GIS software vendor Intergraph and Louisiana State University (LSU), LCET created a learning curriculum focused on teaching students how to combine Web-based mapping and fieldwork for GIS data collection. In light of 9/11 and Homeland Security, LCET chose emergency preparedness as the first real-world Quest application.

Representatives from the Red Cross and the Louisiana Office of Emergency Preparedness (LOEP) offered suggestions on the type of geographic data the students could collect for the project. Because schools



A standard Web browser is all that is needed to view the data-rich maps. Students can zoom in on maps to reveal details, such as their school building.

are often used as emergency shelters, it made sense for students to gather information about the capacities of their schools and the facilities available for emergency officials to use in deciding how and when school buildings might be used to house evacuees.

LOEP maintains a database of shelters containing the details needed to identify structures suitable to accommodate people in various types of emergencies, according to Sean Fontenot, LOEP's acting division chief of plans, training, and exercise.

"We will compare the Quest data with our database to update our in-

formation and ensure its accuracy," he said. "Without the students' involvement in this project, there is no way we could collect this much data ourselves."

LCET has been tabulating results and encouraging additional schools to participate. Data collected by the students will be ready for practical use by emergency agencies in the next couple of years.

Building the Quest

The Geographic Information Center at LSU in Baton Rouge has built an extensive database of geographic data



Davies Elementary student teams use GPS receivers to find the latitude and longitude of their school.



Trist Middle School students record their school's data.



Chalmette High School students gather data for the project.

layers, including aerial photography taken in 2001 and processed into *digital ortho quarter-quads* (DOQQs), computer-generated images of an aerial photograph, covering the entire state. LSU donated this DOQQ database as the primary basemap layer for the Quest program. LCET arranged for the establishment of a data center

in the LSU CAD/GIS laboratory to archive and serve the Quest data.

During a period of several months, Intergraph created the online and digital mapping portions of the Quest with GIS program using Web-based GIS technology. This system delivers the DOQQs, several data layers, and basic online query functionality to

the students over the Internet. Each classroom needs only an Internet connection and standard Web browsing software to access and view the online map and input their collected data.

The primary GIS capability provided to the students is online mapping. They can use a mouse to zoom, pan, and scroll around the maps and orthophotographs representing their state. They can also query the map to find specific locations or features by keying in the name of parishes, cities, latitude/longitude coordinates, and major highways. The GIS then displays the portion of the image showing the desired feature or area. DOQQ resolution is sufficient for students to easily identify any school building.

The Web interface allows the participating teachers or students to register their schools and set up login identifications they will use to submit and update their collected information. The registration screen lists the name of every public and private K–12 school in the state, all of which have received invitations to participate.

Learning with GIS

LCET has developed three separate curricula based on grade levels to prepare the students to use the GIS. The fun starts when the students begin collecting data. Their first task is to find the global address (latitude/longitude location) for the school. Not only is this initial step educational for the students, it's crucial for the emergency planning aspect of the program because many of Louisiana's rural schools do not have street addresses.

Although some schools obtained GPS receivers especially for the project, several schools, such as those in St. Bernard Parish, just east of New Orleans, already owned GPS units and had experience operating them. For these schools, finding the global

address focused on learning how to use the devices.

"A lesson on latitude and longitude that is pretty boring in the classroom turned out to be much more interesting outside," said Carl Gaines, Jr., technology coordinator for St. Bernard Parish Public Schools. "When the students connected to those satellites and could see that we are six feet below sea level here, it really grabbed their attention."

At schools without GPS receivers, the students were instructed how to find their parish on the GIS screen, either by keying in information or simply by viewing the digital map. With their parish highlighted, the students then zoomed into the DOQQs looking for familiar landmarks until they could actually spot the school building. The GIS then provided the location coordinates.

The GIS lesson rarely ended there. The students typically became curious about what else they could find and learn from the unique overhead perspective of the digital orthophotograph. The vast majority wanted to see their houses and the streets where they live. This exercise alone encouraged them to think about how geography relates to where they live and go to school—and where they might go to find shelter.

Once students had the global address, teachers usually divided the class into groups assigned to gather the requested information. Much of these data relate directly to the capacity of the school building, with students listing numbers of classrooms, large rooms (such as gymnasiums), sinks, toilets, showers, beds, and parking spaces.

Moreover, other information is geared toward services offered in the school that might make it a preferable shelter, including the availability of food storage, medical supplies, electric generators, and handicap-accessible facilities. Finally, the stu-

dents were asked to rate whether they believe the school is an appropriate shelter in the event of a hurricane, tornado, flood, oil spill, or other emergency event.

This last question was designed to get the students to take into account geographic and facility details in considering whether their school is a suitable shelter and what its capacity might be. As hoped, early Quest results indicated that students catch on to the importance of geography very quickly. Plaquemines Parish, a low-lying area along the Gulf Coast, illustrates this point well. When the students saw the imagery of the parish and the water surrounding it, they realized immediately which areas were in greater danger during a storm and understood what that meant for the rest of the parish.

"Students knew that those schools in the lower parts of the parish had more to worry about," explained Susan Leger, instructional technology facilitator for Plaquemines. "And those schools on higher land realized they probably didn't have enough room to accommodate everyone who might seek shelter there." Plaquemines Parish does have evacuation plans that have been developed with support from adjoining parishes.

Planning the Next Quest

In the first five months of Quest with GIS, more than 400 schools out of approximately 1,800 registered to participate, and 260 successfully completed the survey. School systems in five parishes have recorded 100% participation in the project. An additional 57 schools have registered for the Quest since the 2003 school year.

One of the advantages of the digital GIS is that teachers do not have to stop teaching about the technology when the lesson plan is completed. Many social studies teachers who received GIS software for their classrooms are now downloading the

Quest with GIS data inputs from other schools so their students can perform geospatial analysis of shelter information across an entire city or parish.

Other teachers are developing projects that are unrelated to emergency preparedness. In Calcasieu Parish, for example, a summer technology camp for seventh and eighth graders initiated a project focusing on the history of local residents by visiting nearby cemeteries. They used the Quest with GIS interactive map to identify and locate all of the graveyards, some long forgotten, in their parish.

Although this project will continue, LCET has introduced a new project and curriculum to the Quest Web site. This addition builds on the GIS skills and knowledge gained in the previous program and applies it to a new real-world problem. Louisiana standards-based lesson plans included in this new project investigate the processes involved in preserving historic markers in Louisiana as well as discovering why this is important in caring for our heritage. As a result, students are preserving their heritage digitally on an interactive map.

Resources

Intergraph Mapping and Geospatial Solutions:
<http://www.intergraph.com/gis>

Intergraph grant programs for education:
<http://imgs.intergraph.com/education/grants.asp>

Louisiana Department of Education's lesson plan builder: <http://www.doe.state.la.us/conn/>

Quest with GIS: <http://www.questwithgis.com>



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